(54) **METHOD AND APPARATUS FOR OPERATING ON DATA WITH A CONCEPTUAL DATA MANIPULATION LANGUAGE**

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(57) **ABSTRACT**

A data services layer is disclosed which maintains a dictionary of conceptual information and physical information about the data. Machine-readable requests to access the data are in a form related to a conceptual organization of the data, and is not specific to a physical organization of the data. A machine-readable query to obtain a subset of the data is produced by referencing the dictionary of conceptual and physical information about the data. The conceptual information is obtained from an object-relational-model of the data, and the physical information indicates how the data is organized on the data storage medium. Requests are written in a conceptual query language (CQL) which substantially uses terms belonging to or derived from a natural language. CQL includes terms in the classes of names and concepts, and wherein name terms are used to describe objects in the object-relational-model of the data, and concept terms are used to specify the data subset desired. Concept terms specify Facts desired from the data, and filters and sort specifications to be applied to the Facts. In an example embodiment, the data is organized in rows, and CQL includes a select command that retrieves data in rows. A set of data representing a profile of performance characteristics related to how to retrieve data is provided, and queries are formed based at least in part on the performance characteristics.

48 Claims, 47 Drawing Sheets